say that in every case these replies appear to us completely satisfactory, and are everywhere rendered in a manner the courtesy of which not many English naturalists could nowadays emulate. But, besides answering criticisms, he has in several cases important criticisms to make. For instance, we have a tolerably full republication of his research upon the colour-sense of Daphnia, whereby he so completely overturned the results previously published by the late M. Paul Bert. The following is a good example of the application of his criticism in another direction:—

> "With reference to the power which insects possess of determining form, Plateau has recently made some ingenious experiments. Suppose a room into which the light enters by two equal and similar orifices, and suppose an insect set free at the back of the room, it will at once fly to the light, but the two openings being alike, it will go indifferently to either one or the other. That such is the case Plateau's experiments clearly show, and, moreover, prove that a comparatively small increase in the amount of light will attract the insect to one orifice in preference to the other. It occurred, then, to Plateau to utilize this by varying the form of the opening, so that, the light admitted being equal, the opening on the one side should leave a clear passage, while that on the other should be divided by bars large enough to be easily visible, and sufficiently close to prevent the insect from passing. . . . The insects seem to have gone most often to the trellised opening. M. Plateau concludes that insects do not distinguish differences of form, or can only do so very badly. I confess, however, that these experiments, ingenious as they are, do not seem to me to justify the conclusions which M. Plateau draws from them. Unless the insects had some means of measuring distance (of which we have no clear evidence), they could not tell that even the smaller orifice might not be quite large enough to afford them a free passage. The bars, moreover, would probably appear to them somewhat blurred. Again, they could not possibly tell that the bars really crossed the orifice, and if they were situated an inch or two further off they would constitute no barrier. I have tried some experiments, not yet enough to be conclusive, but which lead me to a different conclusion from that of M. Plateau. I trained wasps to come to a drop of honey placed on paper, and, when the insects had learnt their lesson, changed the form of the paper. . . . It certainly seemed to me that the insect recognized the change."

In the remaining portion of the book, or the portion which deals with "Instinct and Intelligence," we have three chapters. The first is an admirable discussion of one of the most wonderful instincts in the animal kingdom, viz. that of the Sphex stinging only the nerve-centres of the spiders, insects, or caterpillars, which she thus paralyzes without killing, before inclosing them with her progeny, whose food they are afterwards to constitute. Sir John has some good critical remarks to offer on the subject, and also some shrewd speculations upon the possible origin of the instinct. His hypothesis very much resembles that which was arrived at independently by the late Mr. Darwin, and which, therefore, is now in part quoted by Sir John. The quotation runs:—

> "I suppose that the sand-wasps originally merely killed their prey by stinging them in many places, and that to sting a certain segment was found by far the most successful method, and was inherited like the tendency of a bull-dog to pin the nose of a bull, or of a ferret to bite the cerebellum. It would not be a very great step in advance to prick the ganglion of its prey only slightly, and thus to give its larvæ fresh meat instead of only dried meat."

Here, by the way, we have an excellent instance of the difficulty which we so often encounter in the domain of instinct, when we relinquish the so-called Lamarckian principle of the inheritance of acquired characters. The hypothesis in question goes upon the supposition that some of the ancestors of the Sphex were intelligent enough to notice the peculiar effects which followed upon stinging insects or caterpillars in the particular regions occupied by nerve-centres, and that, in consequence of being habitually guided by their intelligence to sting in these particular regions, their action became hereditary, *i.e.* instinctive. But if, in accordance with post-Darwinian theory, we relinquish this possible guidance by intelligence, and suppose that the whole of this wonderful instinct was built up by natural selection waiting for congenital (*i.e.* fortuitous) variations in the direction of a propensity to sting, say, the nine nerve-centres of a caterpillar—then it surely becomes inconceivable that such an instinct should ever have been developed at all.

A chapter on the supposed sense of direction among the Social Hymenoptera, and another on his now well-known experiments in teaching a dog the use of written signs, bring to a close one of the most instructive and entertaining of the works which have been produced even by Sir John Lubbock.

GEORGE J. ROMANES.

MASSAGE.

Massage and Allied Methods of Treatment. By Herbert Tibbitts, M.D. (London: J. and A. Churchill, 1888.)

IT is seldom that a medical book of such inferior quality has been issued from the press, and the fact that it has found any purchasers is a striking proof how a catching title and an attractive exterior can still mislead the public. Anyone even slightly acquainted with the subject will at once perceive that the writer, whilst professing to teach massage, has not mastered the first principles of the treatment. His modest refusal to accept the office of "high priest of massage" has, indeed, complete justification.

It is not easy to adopt any method in criticizing a work devoid of all attempt at arrangement, but from the chaos of thought and diction we will select a few samples of what the writer has considered suitable food for the minds of his readers.

At the outset the author attempts to define massage, and with a dim consciousness that he has somehow failed, he plaintively declares that his definition is misty. Out of this verbal fog he never emerges, and as he pursues his erratic course it rapidly thickens around him. He has introduced illustrations and quotations from other writers, and in mercy to his readers also gives references to standard authors, who may be read with advantage. Unfortunately he at times becomes bold even to rashness, and launches out on his own account. A few samples of the inevitable result will suffice. On p. 27, whilst in the midst of giving directions for treating the lower limbs, he intercalates the following sentence: "You then massage the muscles from the waist downwards, working

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upwards as before." This has no connection with what has gone before or what follows after. On the next page he says, "for the large and small intestine you massage the lower part" (of the abdomen), having evidently forgotten the position of the transverse colon, which anatomists still believe to be a part of the large intestine. Again, after giving all the less important uses of the saliva, he entirely omits its action in changing the starchy foods into sugar, an omission of which a second-year student would scarcely have been guilty. His readers are left in ignorance of the emulsifying action of the bile on fatty foods, and the pancreas is only considered worthy of mention. In fact the writer, after intimating that the functions of the body could be very well carried on without such an important gland as the spleen, with the modern physiology of which he does not acquaint his readers, leaves us under the impression that the organization of the human body would have been much better planned had Dr. Tibbitts been the designer.

The author claims for a battery he has invented certain qualities, which he declares to be unique, although they are possessed by other machines. He claims for his hospital the honour of being the only one to which a school for massage is attached, totally ignoring what is being done at other institutions. He is the forerunner of Apostoli, and modestly likens himself to Paul and Apollos, he does not say which. "Although Paul planted, Apollos watered," is his misquotation of the Scriptures. He robs Sir James Paget of the honour of a "discovery." Sir James "suggested," but Dr. Tibbitts "originated" afterwards! After claiming on very insufficient grounds to be a forerunner, a discoverer, and a prophet, he finally declares that all the authorities before him were as blind leaders of the blind. Charcot, Russell Reynolds, Hughlings Jackson, Gowers, and such small fry, are all wrong—for has he not looked into all the authorities?—and he now announces in defiance of them the tremendous fact that there is no such thing as hysteria! However, the apparent object of the book has been attained, and the great Holloway must hide his diminished head.

OUR BOOK SHELF.

Rock-forming Minerals. By Frank Rutley, F.G.S., Lecturer on Mineralogy in the Royal School of Mines. With 120 Illustrations. (London: Thomas Murby, 1888.)

THIS book appears to supply a real want among students of that now very popular subject of study, microscopic petrography. Many of the existing text-books, which are for the most part written in German and French, demand a larger acquaintance with the principles of crystallography and physical optics than many students of the subject possess. Mr. Rutley evidently possesses a considerable experience of the wants of students, and is familiar with the kind of difficulties which prove most troublesome to them. With the greatest patience he endeavours to remove these hindrances to their progress, pointing out the different senses in which the same term is sometimes employed, cautioning them against prevalent misunderstandings, and advising them as to the best method of forming just conceptions concerning the abstruse problems with which they have to deal. Very noteworthy and excellent are the numerous drawings, which, though severely diagrammatic rather than pictorial, are admirably suited for their object. The student who follows the advice of the author, and by the aid of cardboard, cork, and pins, constructs a series of models based upon these drawings, will be able to realize the essential peculiarities of the several mineral species in a way that no amount of description will enable him to do. In the general arrangement of this book, Mr. Rutley has followed the same excellent plan as Prof. Rosenbusch in the first volume of his excellent "Mikroskopische Physiographie." The first part of the book, comprising 104 pages, is devoted to general considerations, and the second part (144 pages) to a description of the crystallographic and optical peculiarities of the chief rock-forming minerals, these being grouped according to their system of crystallization. In every part of the book there is evidence of the most painstaking care and conscientious attention to accuracy of detail, and we can heartily recommend the book to those who seek for just such an amount of information on optical principles as will enable them to employ the modern refined methods of petrographical research.

A Text-book of Euclid's Elements for the Use of Schools. Parts I. and II., containing Books I.–VI. By H. S. Hall, M.A., and F. H. Stevens, M.A. (London: Macmillan, 1888.)

WE have here the completion of a work which in its first instalment (Books I. and II.) has already won a considerable amount of favourable notice from teachers. The "end" has "crowned the work" in a similar satisfactory manner; and, without entering into any "odious" comparisons with recent like editions, we consider this to be abreast of the best. Great attention has been paid to the arrangement and composition of the text, and the difficulties which delay beginners have been carefully smoothed and explained. The ordinary proofs have been adhered to as much as possible, and, in the words of the preface, "changes have been adopted only where the old text has been generally found a cause of difficulty."

Alternative proofs are given in many cases, which are less cumbrous than those in vogue already. The subject of proportion has been treated on the system advocated by De Morgan, and here great use has been made of the admirable exposition of it given in the Association's (A.I.G.T.) text-book. The principal propositions have been established in a clear manner, both from the algebraical and geometrical definitions of ratio and proportion, and the distinction between the two modes of treatment is well brought out. The whole of this part forms a good introduction to the sixth book.

The additional feature in the complete treatise is the free use in the third and subsequent books of the signs and abbreviations which are recognized by most teachers, and allowed in the University examinations.

The explanatory matter and additional sections contain all, or nearly all, that is looked for nowadays, and include articles on harmonic section, centres of similarity and similitude, pole and polar, radical axes and transversals. The exercises in the text are well graduated, and should bring out the pupil's acquaintance with, and mastery over, the propositions to which they are appended. More difficult problems are led up to by the solution of typical examples. In conclusion, we need only say the work before us contains all that is needful to a student, who, if he has this, will require no other text-book to become an expert geometer—*i.e.* in so far as outside aid can make one.

A Class-book of Elementary Chemistry. By W. W. Fisher, M.A., F.C.S. (Oxford: Clarendon Press, 1888.)

THE number of elementary books for students of chemistry has increased so greatly during the last ten years, that each new introduction gives rise to a question as to whether the author has justified his position in adding another

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